Idea (1A)

- Communication Scheduling
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Please send corrections (or suggestions) to youngwlim@hotmail.com.

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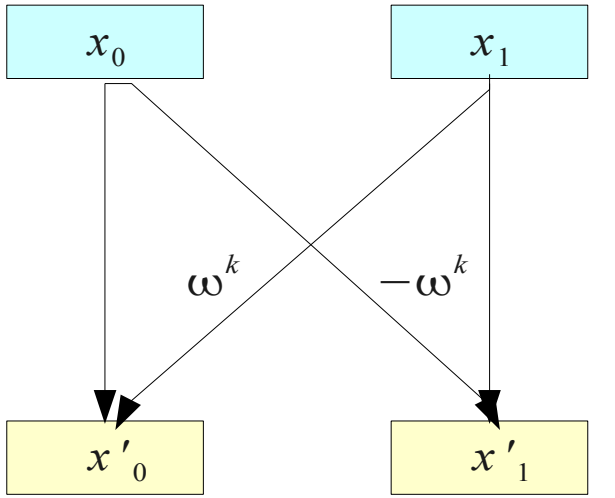
The Butterfly Swap Operations

$$x'_0 = x_0 + \omega^k x_1$$

$$x'_1 = x_0 - \omega^k x_1$$



The Butterfly Time Multiplexed Operations (1)

$$\begin{cases} x'_0 = x_0 + \omega^k x_1 \\ x'_1 = x_0 - \omega^k x_1 \end{cases}$$

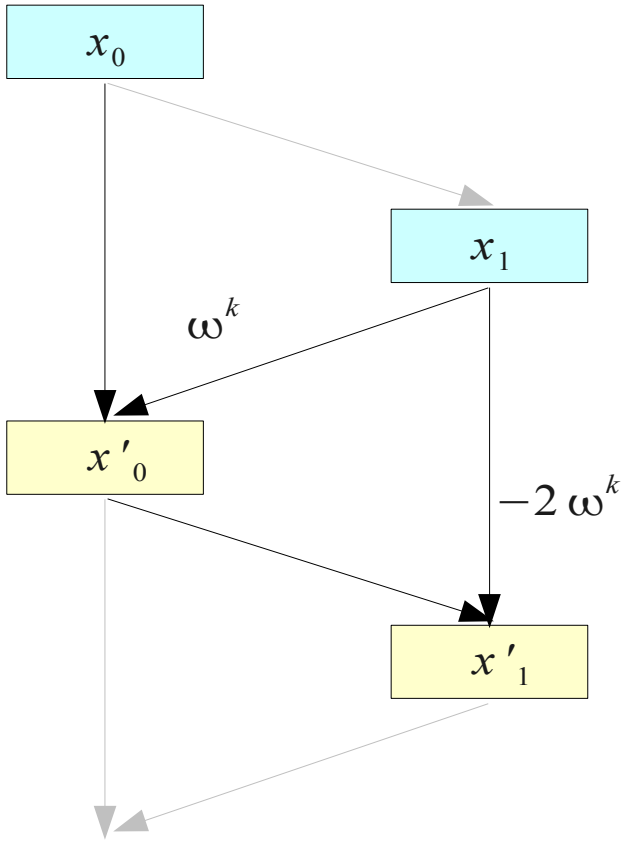
$$x'_0 = x_0 + \omega^k x_1$$

$$x_0 = x'_0 - \omega^k x_1$$

$$x'_1 = x_0 - \omega^k x_1$$

$$\Rightarrow \quad x'_1 = x'_0 - \omega^k x_1 - \omega^k x_1$$

$$x'_1 = x'_0 - 2\,\omega^k x_1$$



The Butterfly Time Multiplexed Operations (2)

$$\begin{cases} x'_0 = x_0 + \omega^k x_1 \\ x'_1 = x_0 - \omega^k x_1 \end{cases}$$

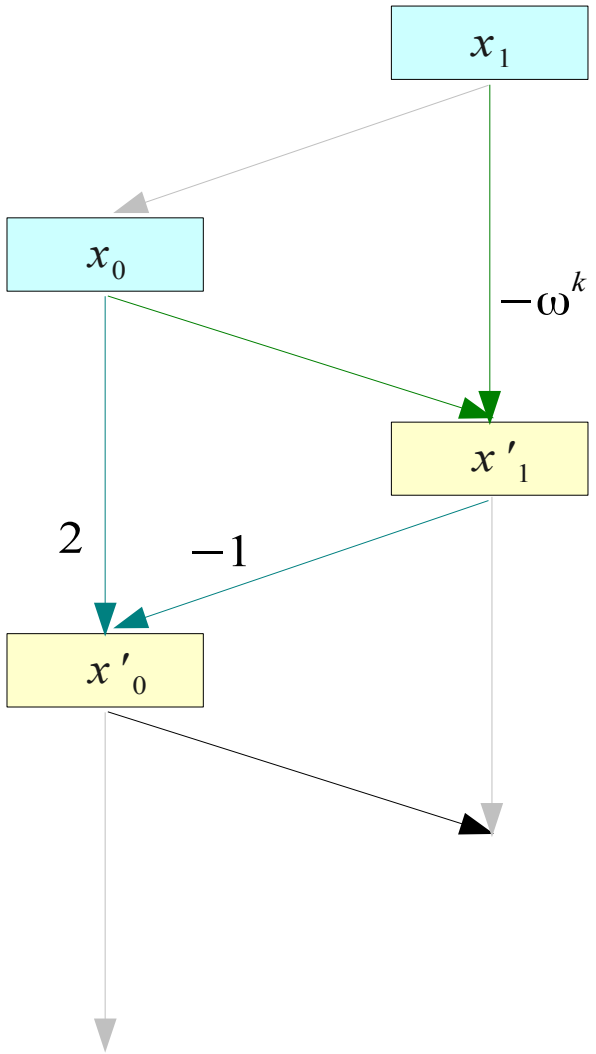
$$x'_1 = x_0 - \omega^k x_1$$

$$x_1 = (x_0 - x'_1)\omega^{-k}$$

$$x'_0 = x_0 + \omega^k x_1$$

$$\Rightarrow \quad x'_0 = x_0 + \omega^k (x_0 - x'_1)\omega^{-k}$$

$$x'_1 = 2x_0 - x_1$$



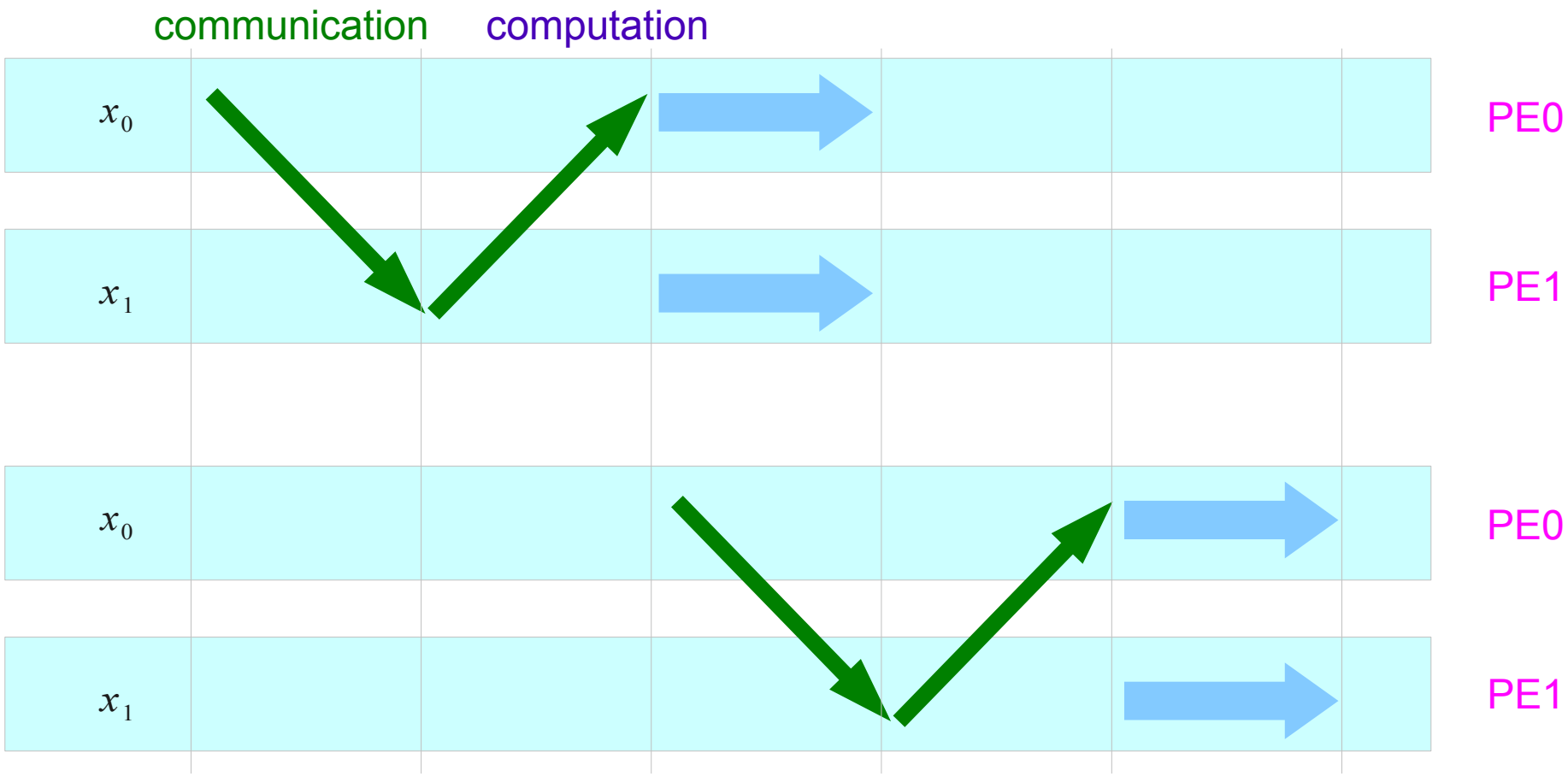
Communication Patterns – High BW

MPI_Sendrecv

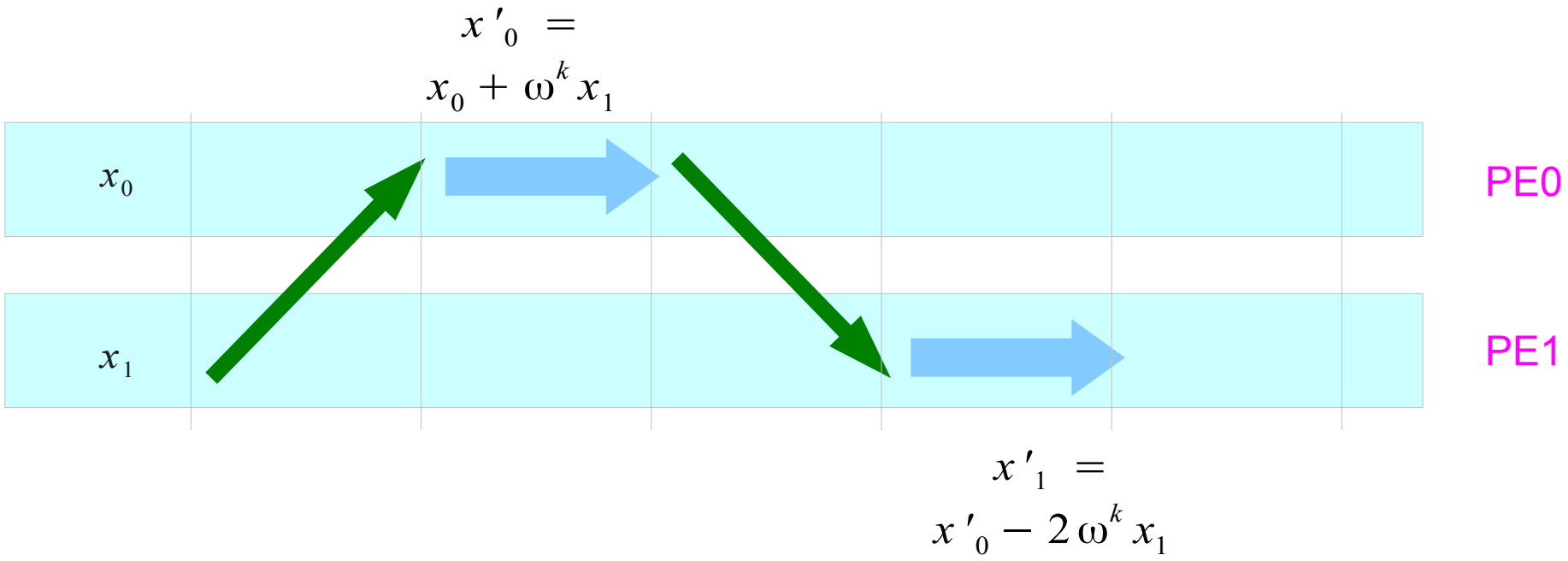
To avoid deadlock, there must be lower level communication scheduling overhead?

Unless real duplex communication link → Shared Bandwidth

Communication Patterns – Limited BW

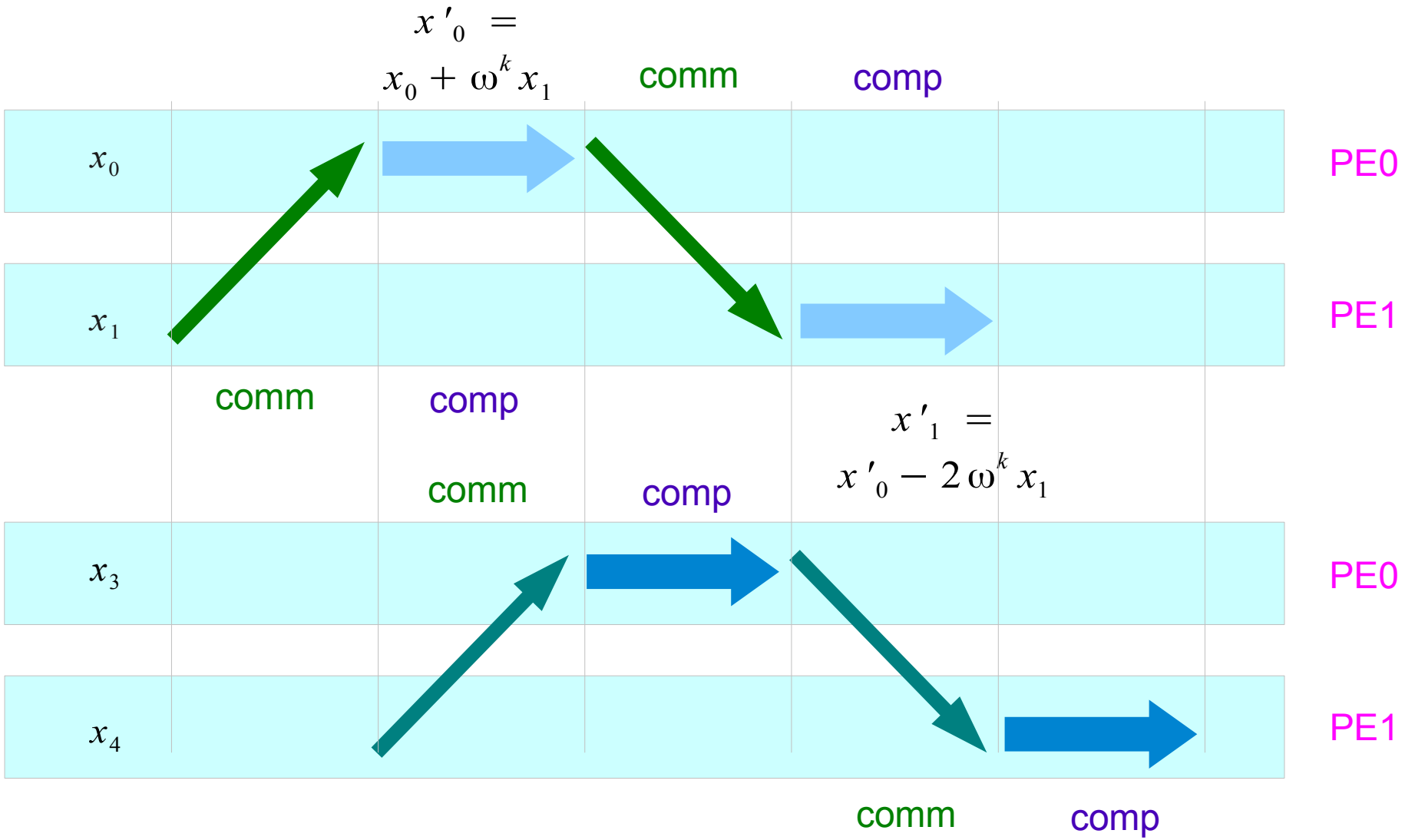


Communication Scheduling – Time Multiplexed

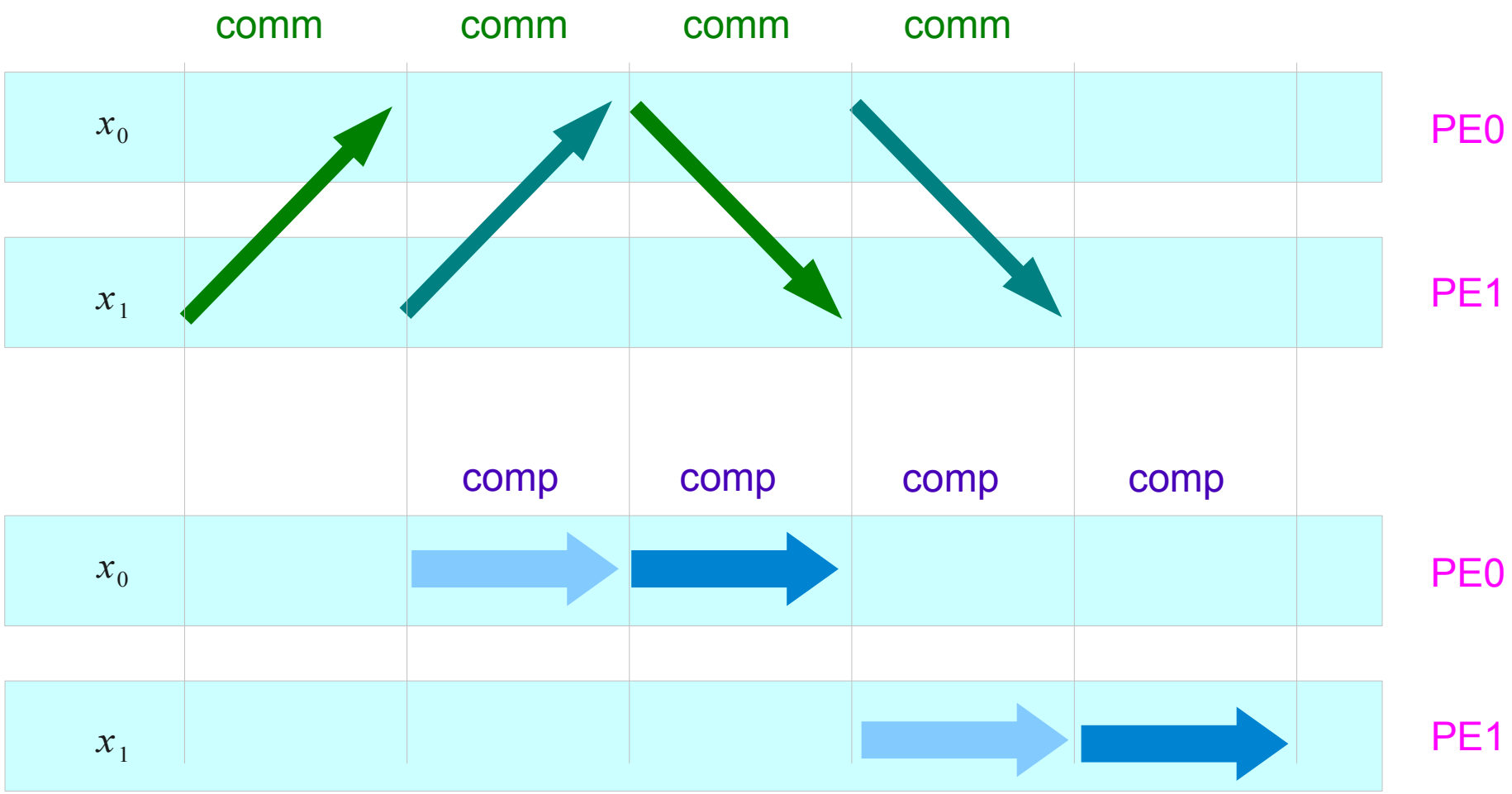


Swapping communication pattern can be avoided

Communication Latency Hiding (1)



Communication Latency Hiding (2)



Speed Up ?

Ratio of Comp time to Comm time?

References

[1] http://en.wikipedia.org/
[2]